

***Clistobothrium carcharodoni* gen. et sp. n. (Cestoda: Tetraphyllidea) from the Spiral Valve of the Great White Shark (*Carcharodon carcharias*)**

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ABSTRACT: *Clistobothrium carcharodoni* gen. et sp. n. from the spiral valve of the great white shark *Carcharodon carcharias* is described. *Clistobothrium* gen. n. differs from its most similar genus *Carpobothrium* in lacking 2 opposing flaps with minute marginal loculi covering each bothridium and possessing 4 large bothridia on extendable bothridial stalks and a single retractable lappet over each sucker.

KEY WORDS: Cestoda, *Clistobothrium carcharodoni* sp. n., Phyllobothriidae, *Clistobothrium* gen. n., great white shark, *Carcharodon carcharias*, southern California.

On 30 August 1982, a large (4.9 m, 1.417 kg) female great white shark, *Carcharodon carcharias* (Linnaeus, 1758), was caught in a gill net set at 6 m, 5 km off Pt. Dume, Los Angeles County, California. The shark was brought to the Pioneer Fish Co., San Pedro, California, where the stomach and spiral valve were removed for study. The stomach contained 1 entire partially digested northern elephant seal. The spiral valve contained a tetraphyllidean cestode that is new to science and is described in this paper.

Materials and Methods

The living worms were fixed in hot (60°C) alcohol-formalin-acetic acid for 24 hr and stored in 70% ethanol. Whole mounts were stained in Semichon's acetocarmine and celestine blue B, dehydrated in a graded ethanol series, cleared in methyl salicylate, and mounted in permount. Specimens for SEM were critical point dried using CO₂ as the transition fluid in a Polaron critical point dryer and mounted on specimen stubs using conductive graphite paint (TV tube coat). Specimens were coated for 10 min at 10 mA with gold-palladium in a Technics Hummer V sputter coater and examined with a Cambridge Stereoscan 150 at 8–20 kV. All measurements are in micrometers unless otherwise indicated and are given as the mean with ranges in parentheses. Illustrations were made with the aid of a drawing tube.

***Clistobothrium carcharodoni* gen. et sp. n. (Figs. 1–6)**

Clistobothrium carcharodoni gen. et sp. n. Phyllobothriidae Braun, 1900. The following description is based on 10 specimens.

SPECIFIC DIAGNOSIS: Medium-sized, acraspedote, anapolytic worms measuring 33 mm (24–40) in length. Strobila composed of 79 (73–85) segments. Neck short, 436 (374–494) in length, with anterior segments wider 797 (681–915) than

long 369 (348–390). Mature segments (65–69) longer than wide, to 982 (563–1,504) long by 737 (640–873) wide. In gravid worms, terminal proglottids approximately 2.5 times longer than wide, 1,851 (1,426–2,765) long by 790 (679–912) wide. Scolex 819 (736–1,260) long by 667 (605–901) wide, with 4 suckers ringed by a folded lappet or hood on retractable stalks separated by a cruciform-shaped apex. Sucker diameter 438 (417–461) long by 371 (333–398) wide. Testes spherical to oblong, 107 (91–123) in number; antiporal, 59 (43–69) with approximately equal numbers occurring pre- 20 (15–24) and postporally 26 (24–30), measuring 53 (32–67) long by 33 (24–59) wide. Vas deferens forming small mass of coils in mature proglottid. Cirrus sac large, extending to midsegment, 421 (364–489) long by 182 (161–208) wide. Cirrus armed with minute spines distally. Genital pores lateral, irregularly alternating, slightly anterior to middle of segment. Ovary posterior, bilobed in cross-section with each lobe shaped as an extended wing when viewed either dorsally or ventrally. Vitellaria large, follicular, in lateral bands. Vitellaria extend behind the ovary in gravid but not in mature segments. Eggs round to oblong, mammilated, 286 long by 260 wide.

HOST: Great white shark, *Carcharodon carcharias*.

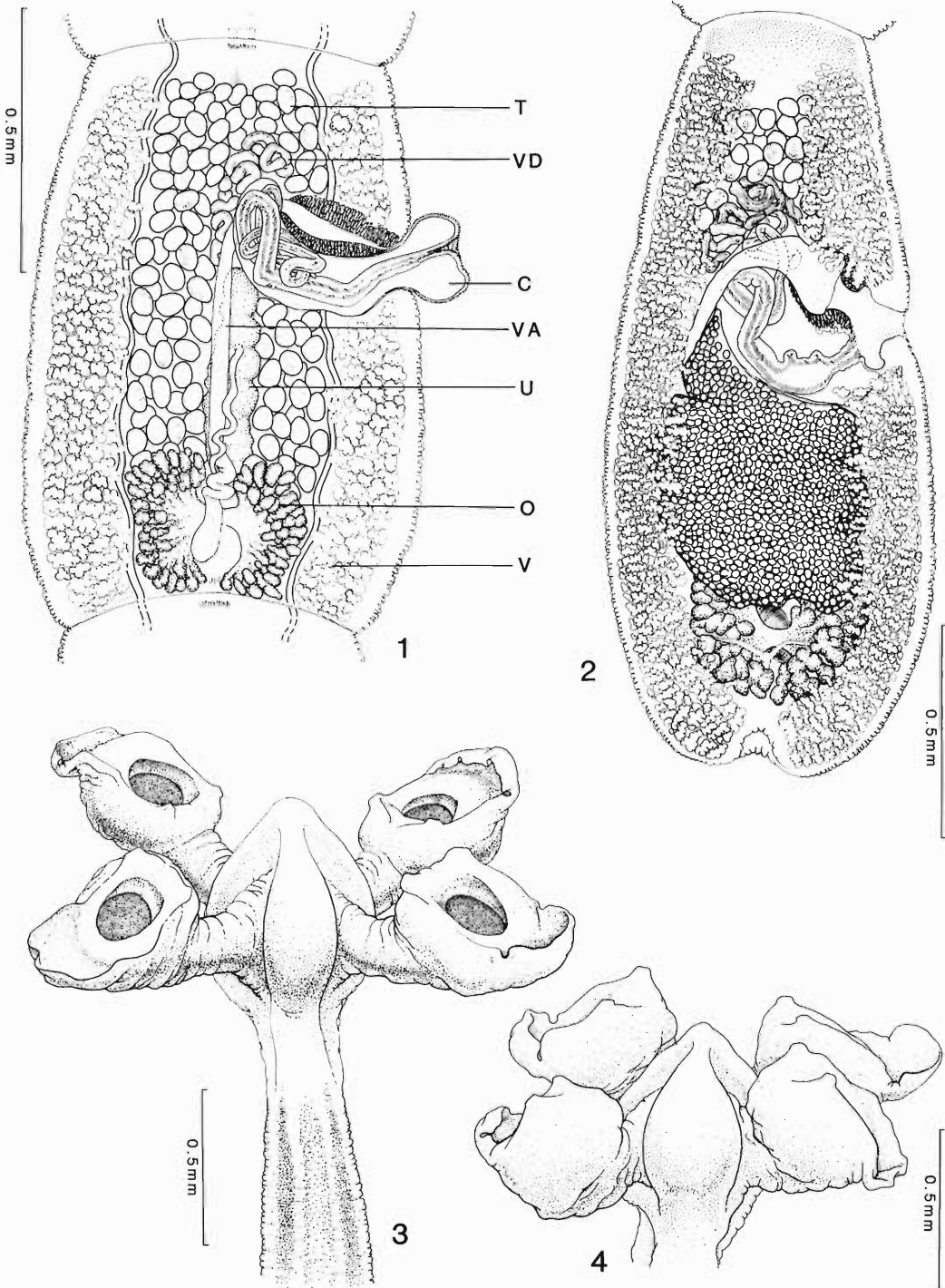
LOCATION: Spiral valve.

LOCALITY: Off Pt. Dume, Los Angeles County, California, 33°55'N, 118°48'W.

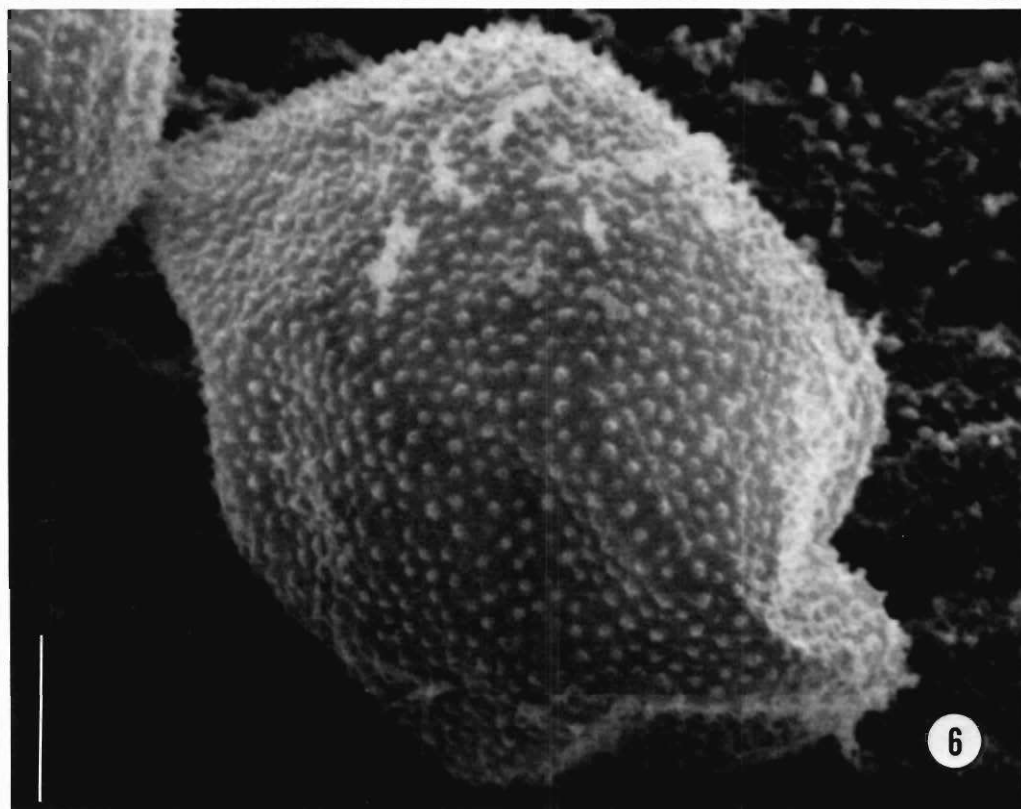
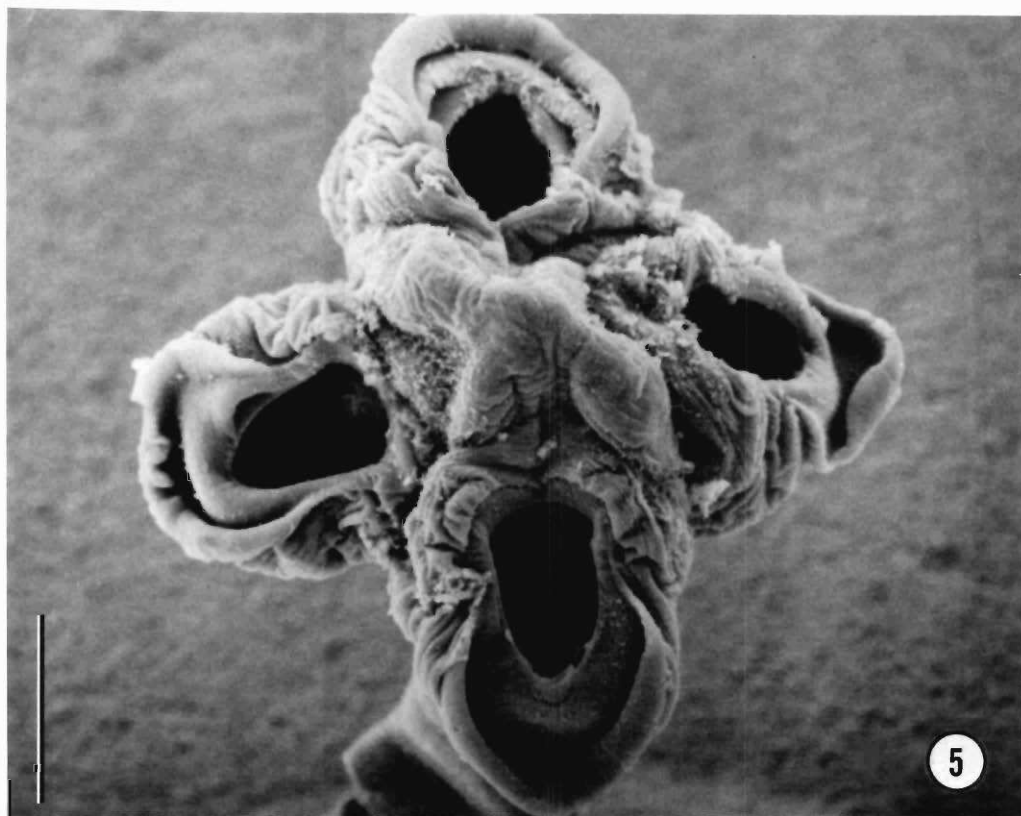
HOLOTYPE: USNM Helm. Coll. No. 80985.

PARATYPES: USNM Helm. Coll. No. 80985, Univ. Neb. State Mus. HWML No. 31397.

ETYMOLOGY: Clisto (Gr.) = closed; bothrios (Gr.) = pit.



Figures 1–4. *Clistobothrium carcharodoni* gen. et sp. n. 1. Mature segment. 2. Terminal segment with gravid uterus. 3. Scolex with bothridial stalks extended. 4. Scolex contracted. Abbreviations: C, cirrus; O, ovary; T, testis; U, uterus; V, vitellarium; VA, vagina; VD, vas deferens.



Figures 5, 6. 5. En face view of scolex showing cruciform-shaped apex, contracted suckers with external folded lappets. Scale bar = 400 μm . 6. Egg showing mammillated surface. Scale bar = 10 μm .

***Clistobothrium* gen. n.**

GENERIC DIAGNOSIS: Phyllobothriidae. Scolex with 4 large bowl-shaped suckers, each sucker on extendable stalk with a folding lappet that projects over sucker opening when extended. Large cruciform-shaped apex of scolex dividing sucker margins. Myzorhynchus absent. Neck short. Mature proglottids more than twice as long as broad. Cirrus armed. Testes numerous, fill intervittelline field anterior to ovary. Vagina anterior to cirrus pouch. Ovary bilobed, posterior. Vitellaria in lateral bands. Uterus reaching only to posterior margin of cirrus pouch. Parasites of *Carcharodon carcharias*.

TYPE SPECIES: *Clistobothrium carcharodoni*.

Discussion

Clistobothrium carcharodoni does not closely resemble any of the existing members of the Phyllobothriidae. It differs from the genus *Phyllobothrium* in scolex morphology and the lack of a tetralobed ovary in cross-section. The only other genus in the family Phyllobothriidae with 4 muscular pedunculate bothridia with flaps is *Carpobothrium chiloscyllyi* Shipley and Hornell, 1906. *Carpobothrium chiloscyllyi* was described from the waters off Sri Lanka from the slender bambooshark, *Chiloscyllium indicum* (Gmelin, 1789) from which the parasite gets its name. This worm has also been recovered by Southwell (1925) from the giant guitarfish and a dasyatid ray, both from the Ceylon Pearl Banks.

Clistobothrium carcharodoni differs from *C. chiloscyllyi* in lacking 2 opposing flaps with minute marginal loculi covering each bothridium. *Clistobothrium carcharodoni* also differs from *C. chiloscyllyi* in lacking conspicuous muscle pads on each flap and by possessing 4 large bothridia on extendable pedunculate stalks and a single retractable lappet over each sucker. The 2 species are similar in that neither has a myzorhynchus or accessory suckers. The internal anatomy of the mature segment is similar but *C. carcharodoni* is a much larger worm (30 mm as opposed to 10 mm for *C. chiloscyllyi*) with approximately 3 times as many segments (73–85 for *C. carcharodoni*, 18–25 for *C. chiloscyllyi*). No gravid segments were observed for *C. chiloscyllyi*, so eggs cannot be compared.

Three species from 2 genera (*Dinobothrium* and *Phyllobothrium*) of the family Phyllobothriidae have been reported previously from the great white shark (Love and Moser, 1983). *Dinobothrium septaria* Beneden, 1889 was reported

from Woods Hole, Massachusetts. The genus *Phyllobothrium* is represented by *P. lactuca* Beneden, 1850 and *P. tumidum* Linton, 1922. The latter species has been previously reported from the great white shark in California waters by Riser (1955).

The larval form of this parasite could very well be 1 of the 11 *Phyllobothrium delphini* Bosc, 1802 morphotypes found in marine mammals by Testa and Dailey (1977). These tetraphyllidean metacestodes are found primarily in the blubber of cetaceans but have also been reported from a number of pinnipeds (Dailey and Brownell, 1972). The hypothetical life cycles of *P. delphini* have been discussed by Southwell and Walker (1936) and Skrjabin (1972).

Linton (1922) published evidence that indicated to him that the *P. loliginis* (considered synonymous with *P. delphini*) found in cephalopods was the larval form of *P. tumidum*, described by him from the mackerel and great white sharks. In the present study, the shark was found with an entire young northern elephant seal in its stomach. Large numbers of phyllobothriid metacestodes have been reported from the blubber of the southern elephant seal, *Mirounga leonina* (Linnaeus, 1758), by Lauckner (1985). However, to date, none have been reported from the northern elephant seal, *Mirounga angustirostris* (Gill, 1866).

Acknowledgments

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| | <u>\$12,545.92</u> |
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